Next Challenge: Human Level Robust Performance

Dr. P. Jonathon Phillips

National Institute of Standards and Technology

Who is this person?

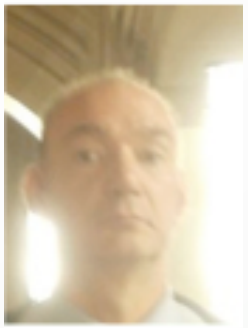
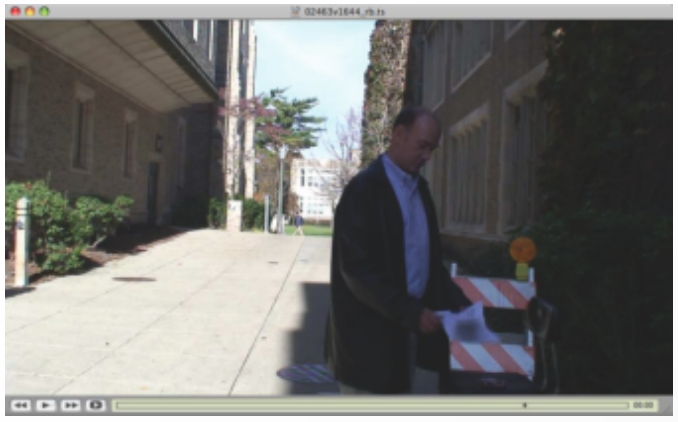
Is this the same person?

Robust Face Recognition








Problem we are interested in:

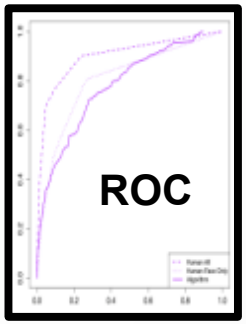
Robust recognition of unfamiliar faces.

Question:

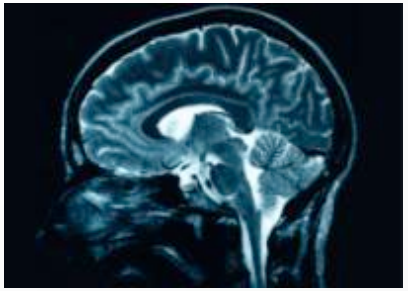
What is the most *robust* face recognition platform?

The Goal

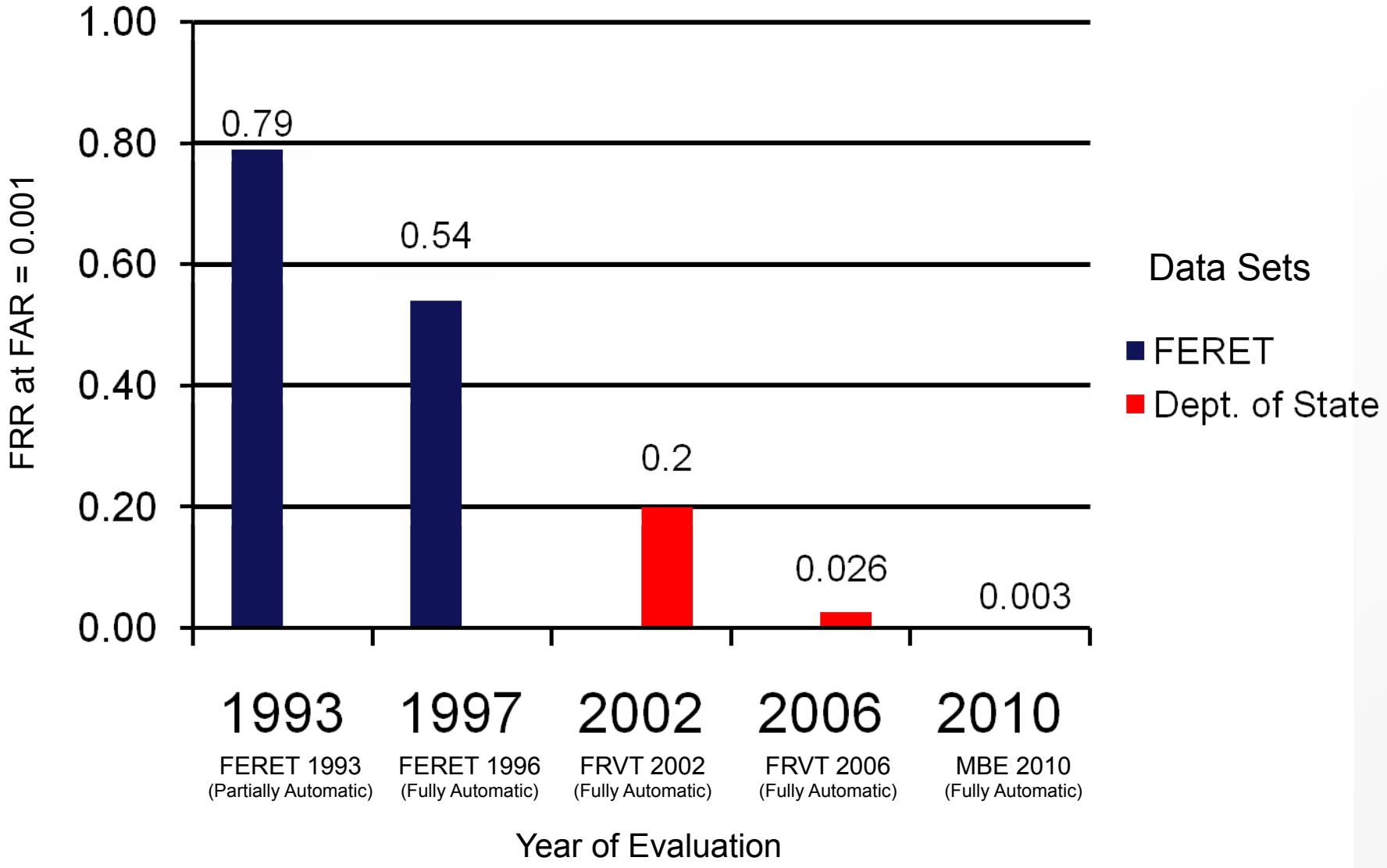
Algorithm / System



$\geq$



From FERET to MBE 2010



The Good, Bad, & Ugly Face Challenge

- Three performance levels
  - Good
  - Bad
  - Ugly
- Nikon D70-6 Mpixels (SLR)
- Indoor & outdoor images
- Frontal face images
- Taken within one year

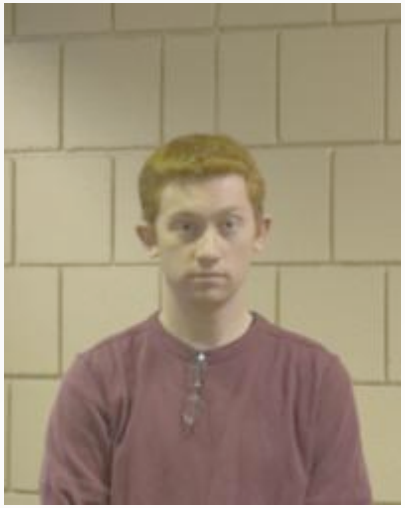
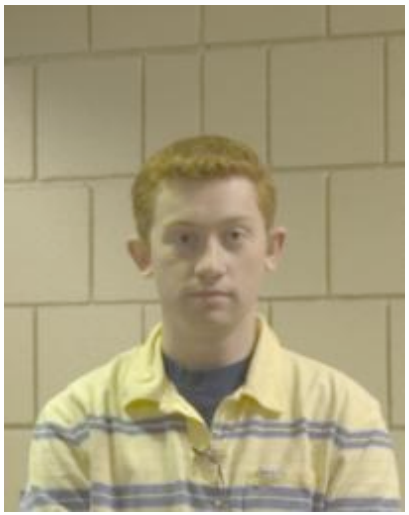
Face Pairs


Good

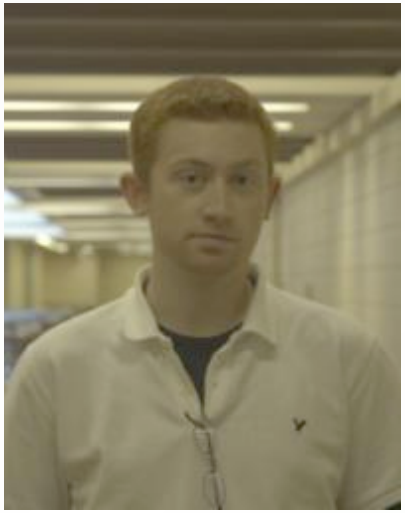
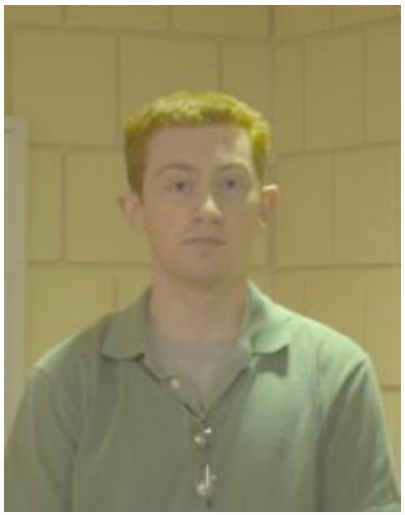

Challenging


Very Challenging

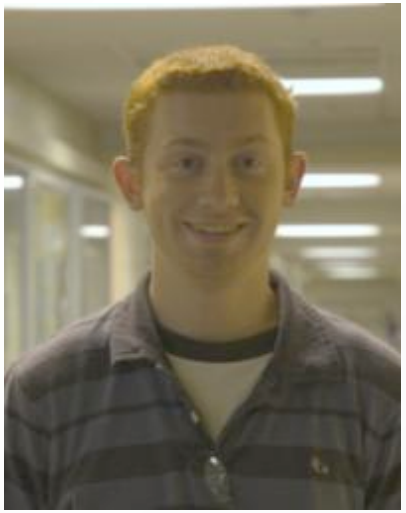
Face Pairs

Good

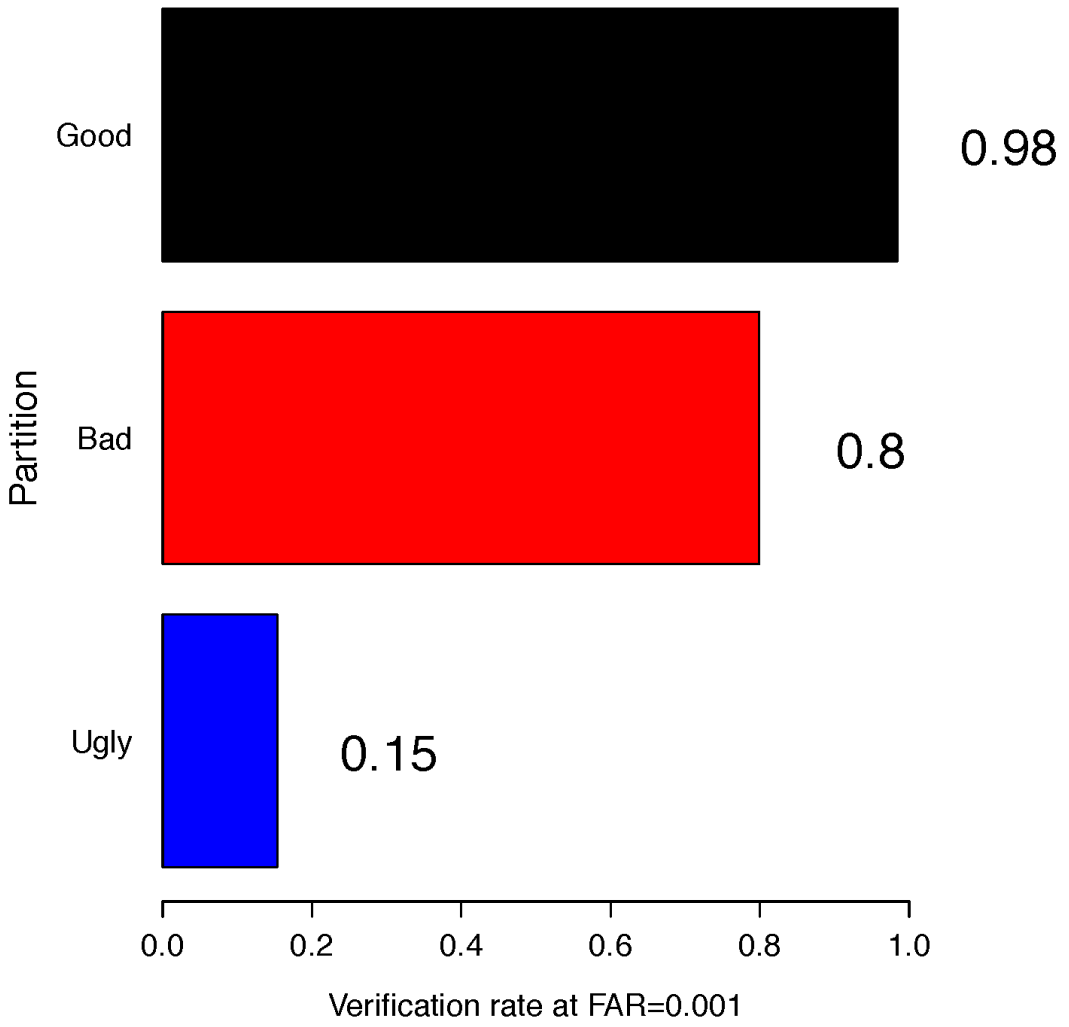



Challenging




Very Challenging

Good, Bad, Ugly Performance



Human and Machine Performance

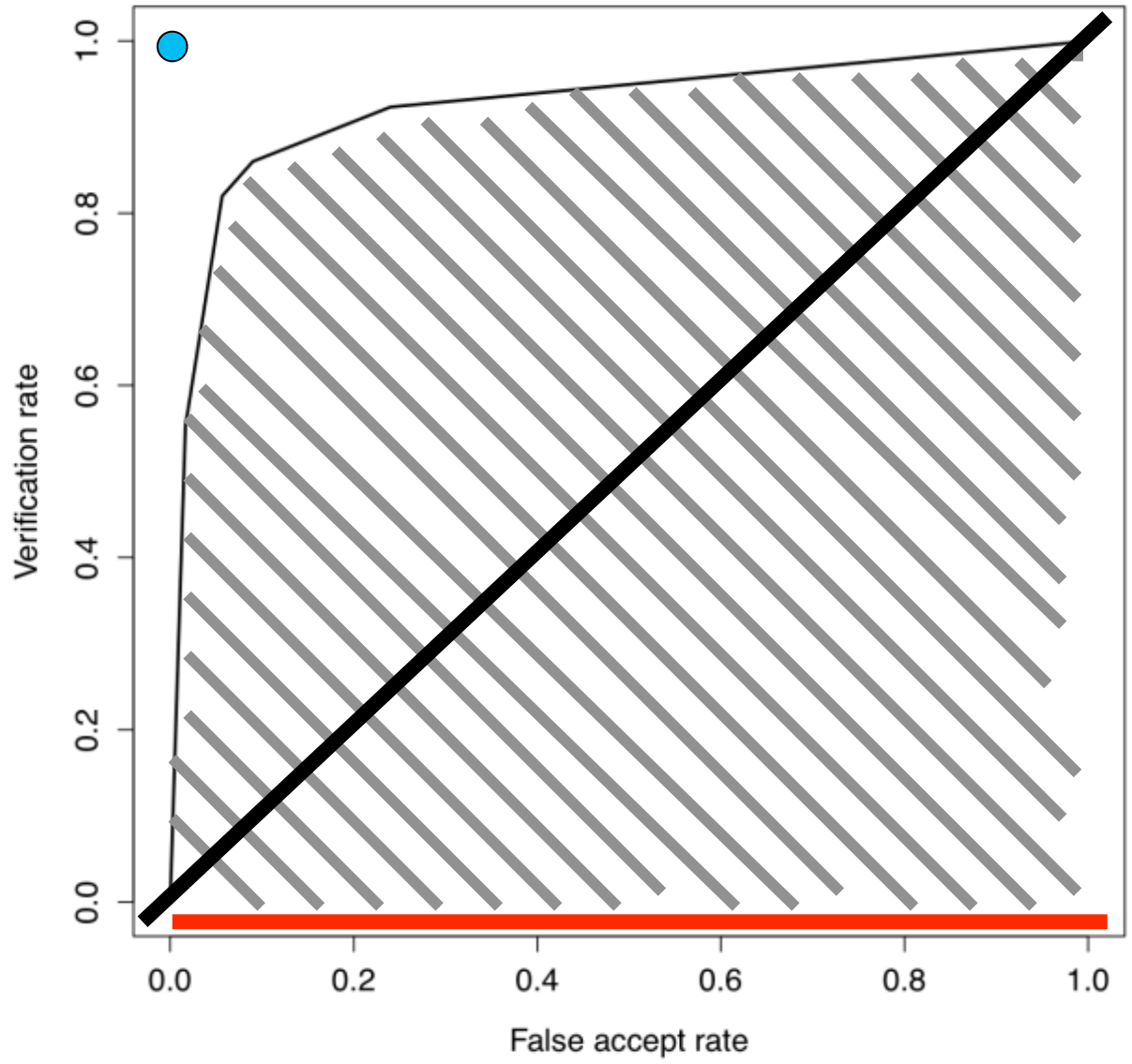
- Mugshots & Mobile Studio environments
  - FRVT 2002/2006
  - MBE 2010
- Mobile Studio vs Ambient Lighting
  - FRGC
  - FRVT 2006
- Ambient Lighting (indoor/outdoor)
  - Good, Bad, & Ugly
- Hard Still Cases (reverse ROC)
- Video

NIST

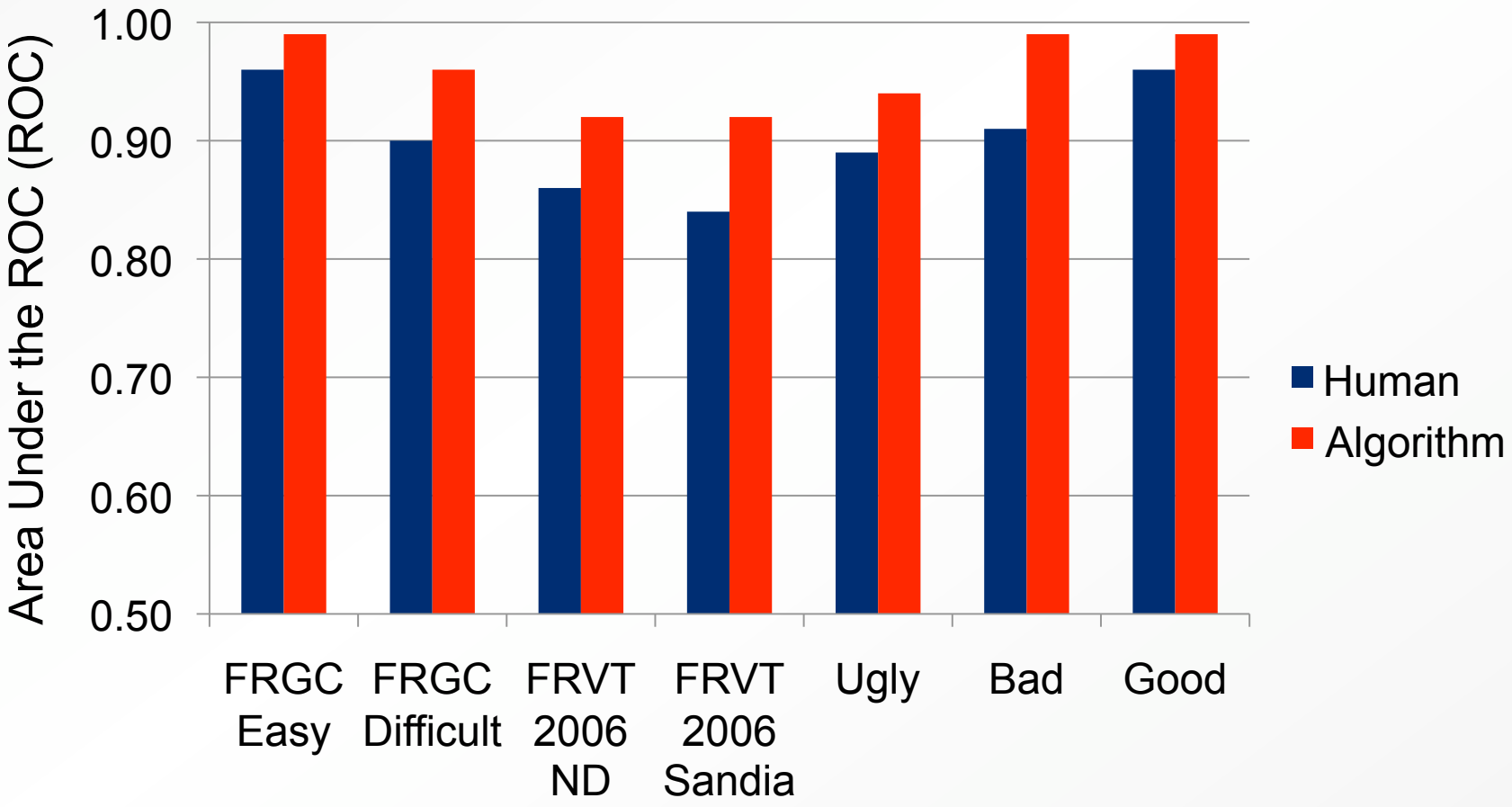
Measuring Human Performance

- Human subject raters respond…
  - 1. sure they are the same person
  - 2. think they are the same person
  - 3. not sure
  - 4. think they are not the same person
  - 5. sure they are not the same person

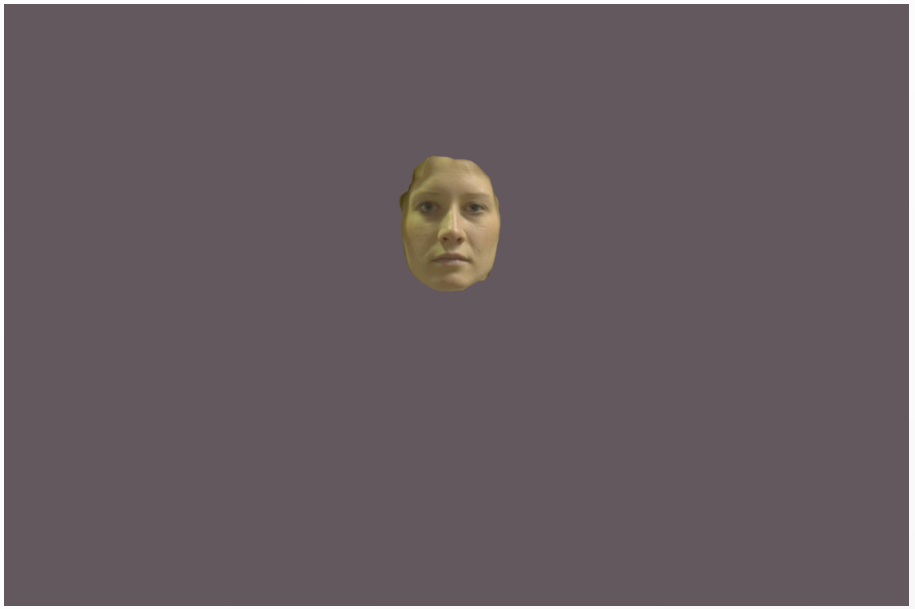
Area Under Curve (AUC)



Frontal Still Face Performance



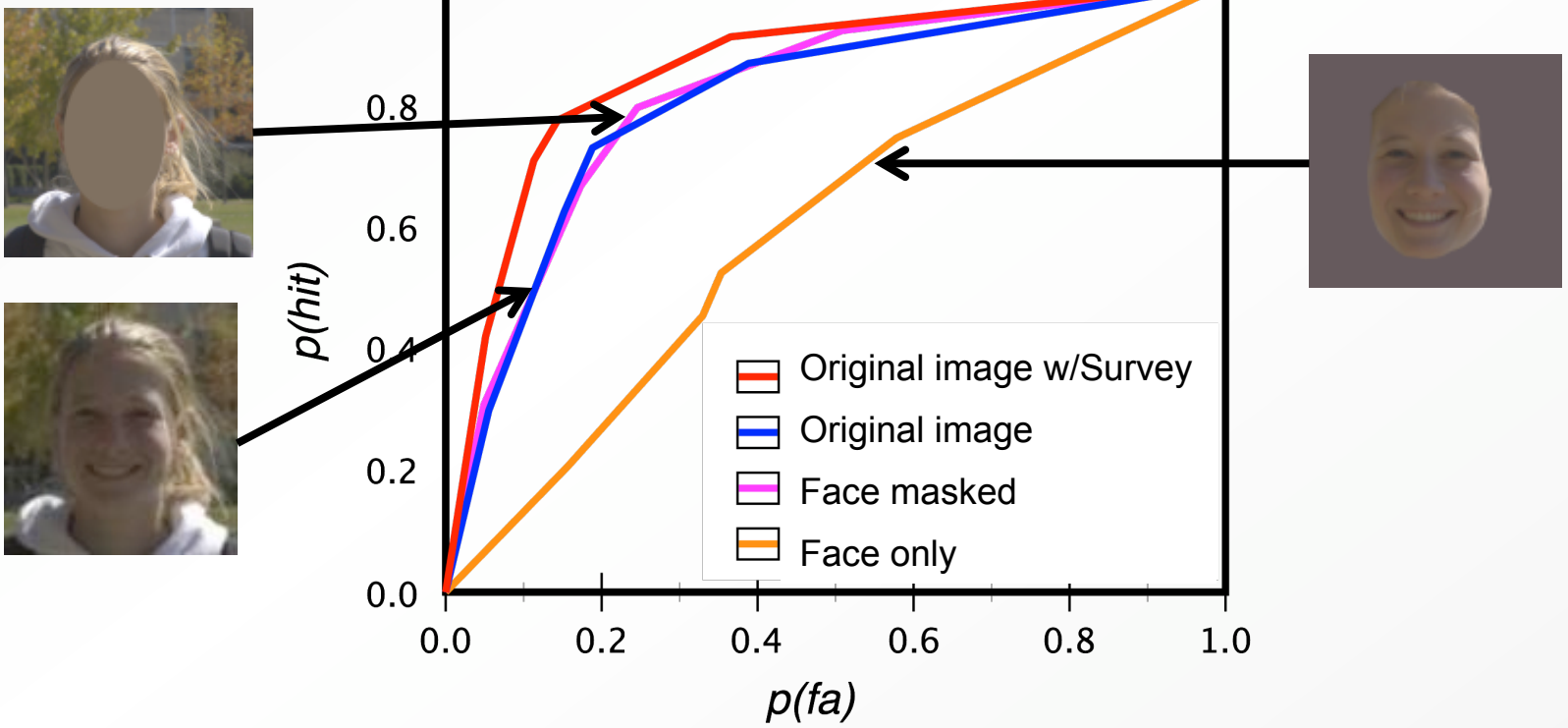
Is this same person?



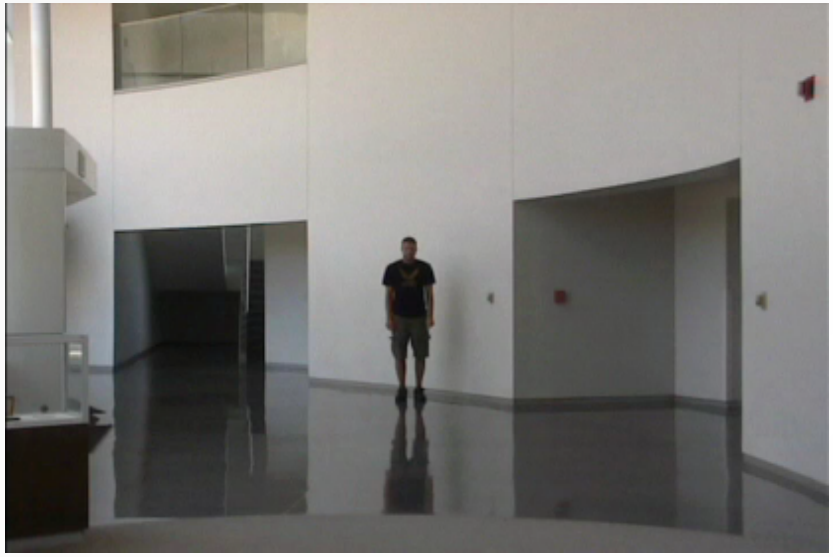
Is this same person?

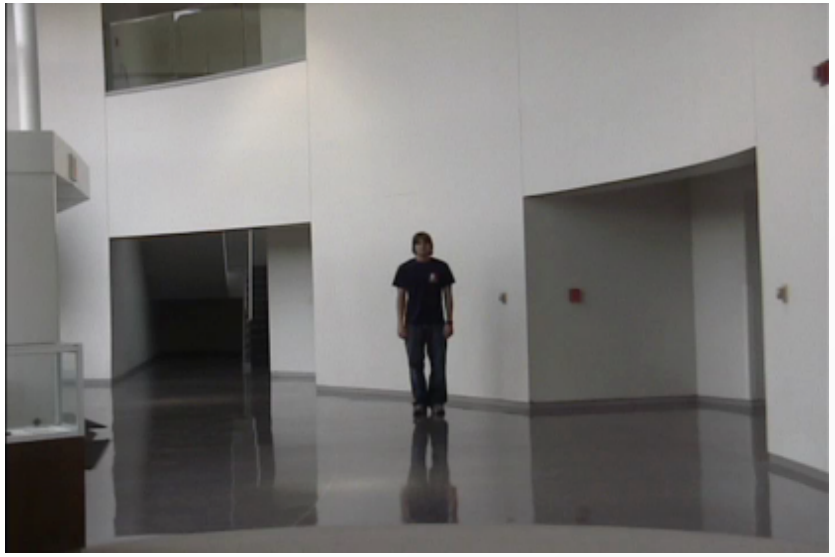
Is this same person?

Human Performance on reverseROC



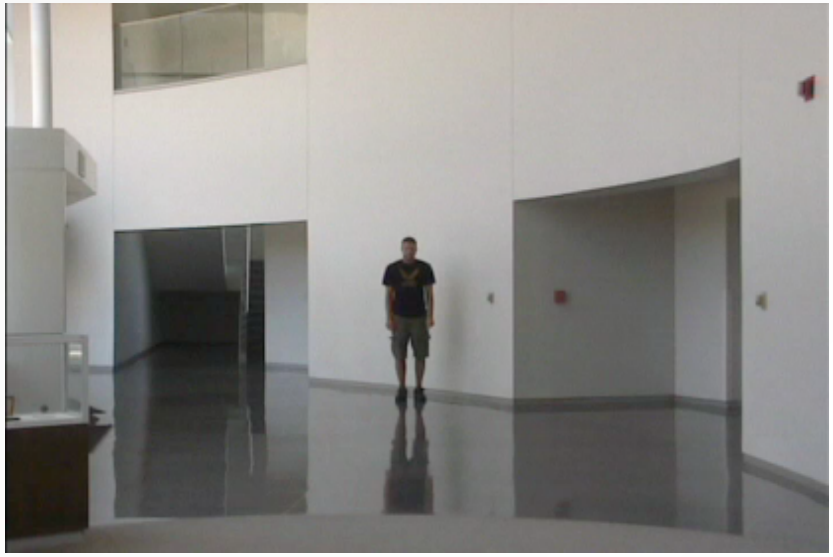
Video: Walking vs. Walking





- Human subject raters respond…
  - 1. sure they are the same person
  - 2. think they are the same person
  - 3. not sure
  - 4. think they are not the same person
  - 5. sure they are not the same person

Video: Walking vs. Conversation

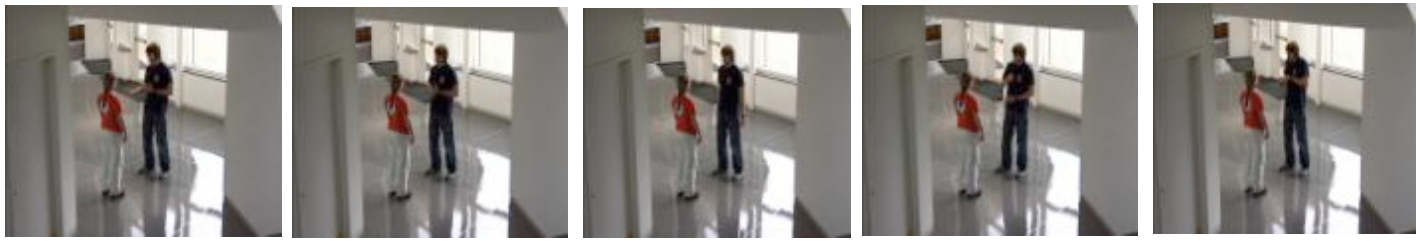


- Human subject raters respond…
  - 1. sure they are the same person
  - 2. think they are the same person
  - 3. not sure
  - 4. think they are not the same person
  - 5. sure they are not the same person

Gait Experiments

gait video

conversation video

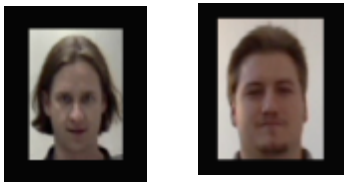


body only

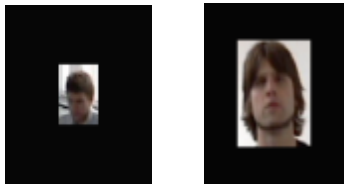
face only

Static Face

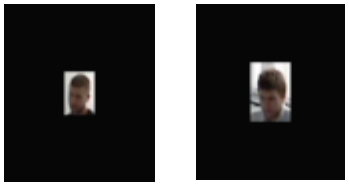
GG



CG



CC

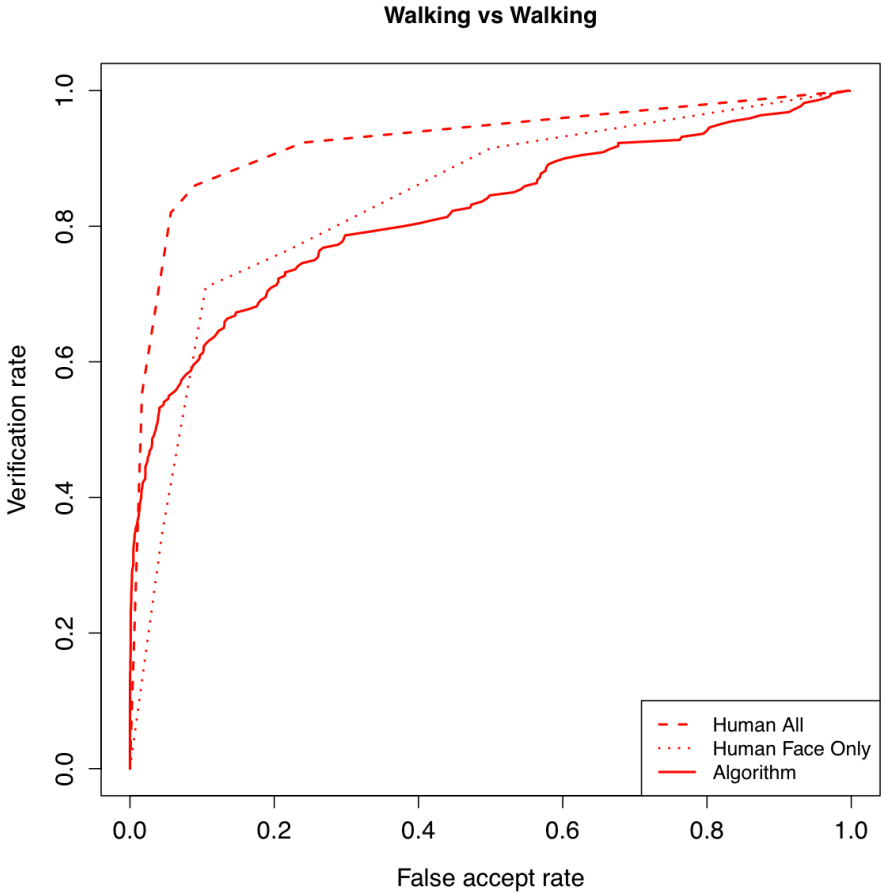


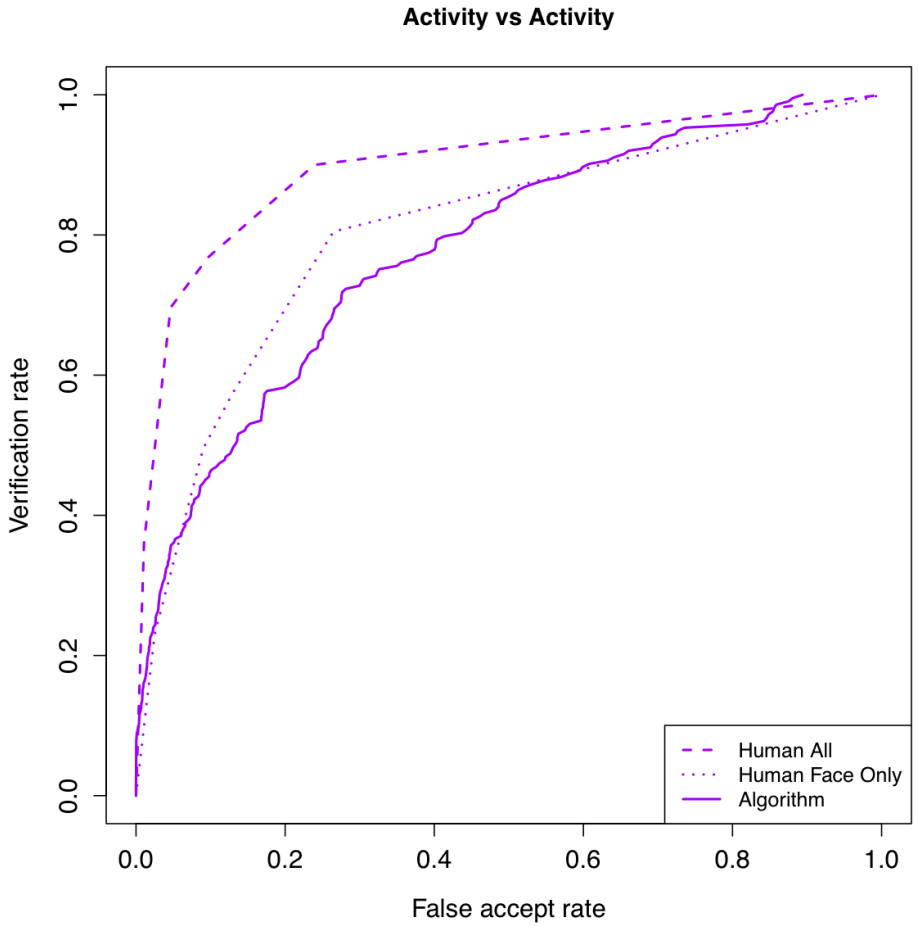
Next Directions

- In hard cases (poor viewing conditions), humans take advantage of face, body, still, & video
- Evidence: algorithms do NOT take advantage of face, body, still, & video
- Learn from the human visual system.
  - Functional
  - Perceptual
- Incorporate into algorithm design.

Video Performance

- Human and Machine
- UT Dallas Data Set
- Video Dictionary Algorithm—UMD



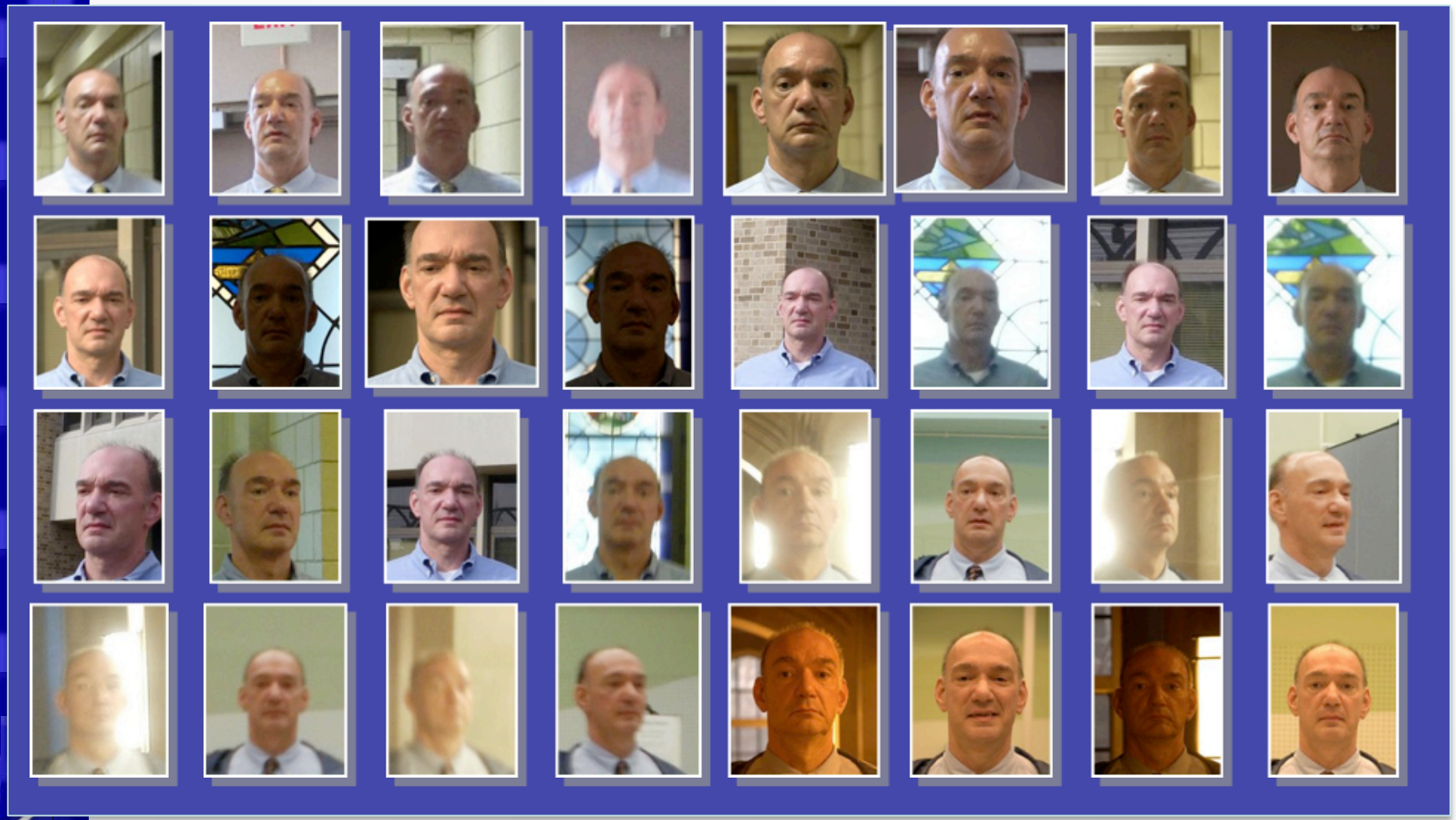


Human and Machine Performance

- Algorithms Better (Untrained Humans)
  - Mugshots & Mobile Studio environments
  - Digital Single Lens Reflex
    - Mobile Studio and Ambient Lighting
- Humans Better
  - Non-face identity cues
  - Cross-pose (video—one experiment)
- Not Measured
  - Point and Shot Cameras
  - Change in Pose (in general)

NIST

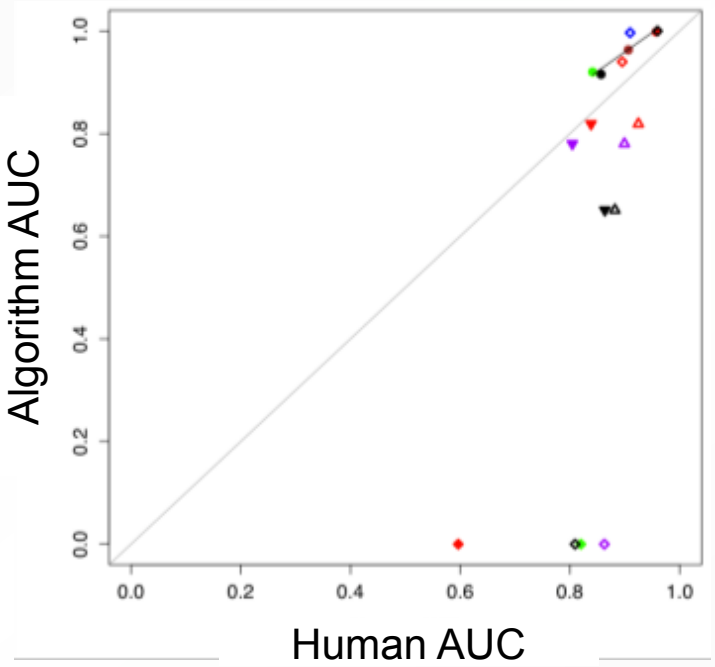
Example of Point & Shoot Face Images



Courtesy PittPatt

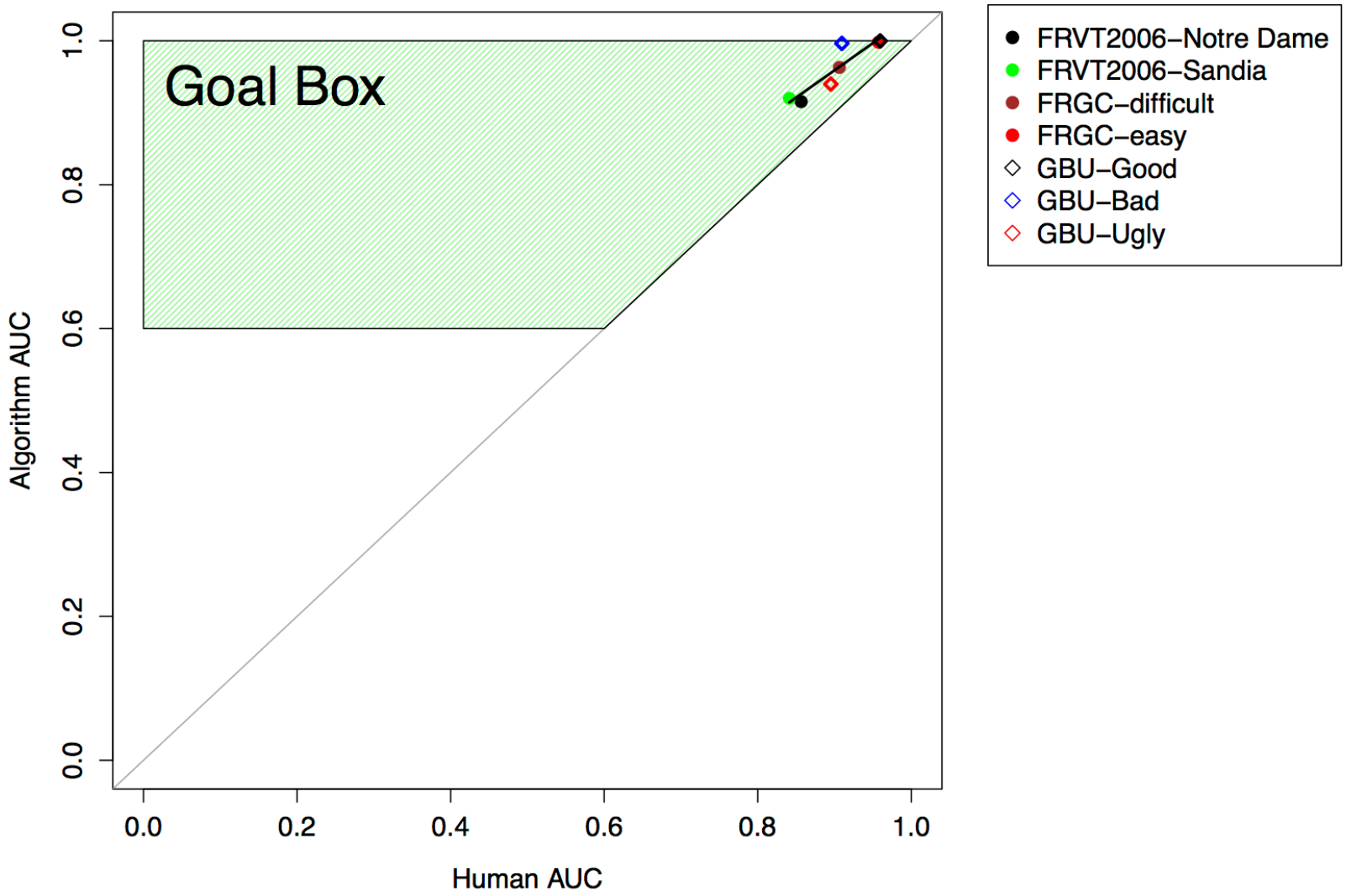
Hurdle: Measuring Success

- Develop structure for comparing human and machine performance

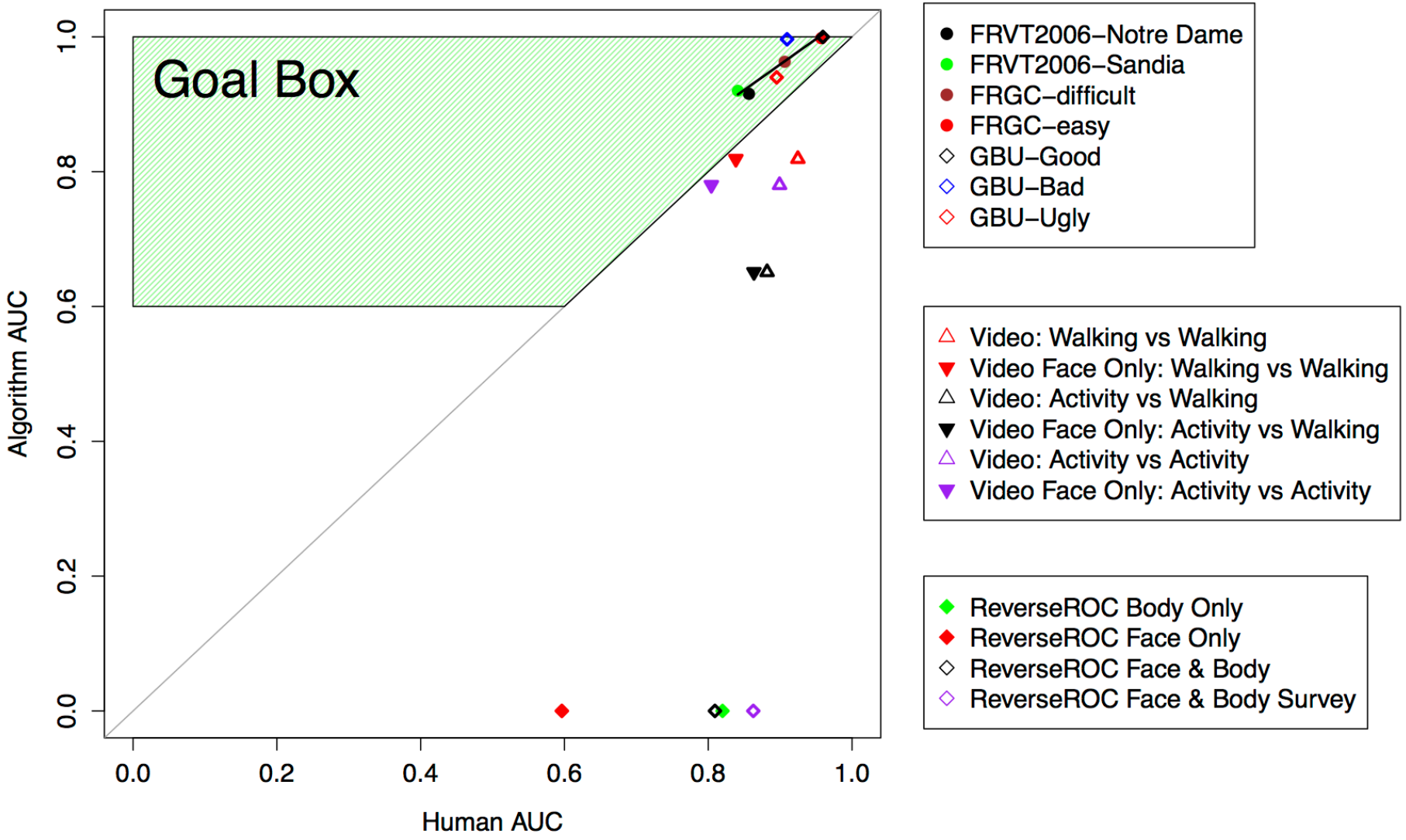


- Adapting recent methods from Neuroscience.

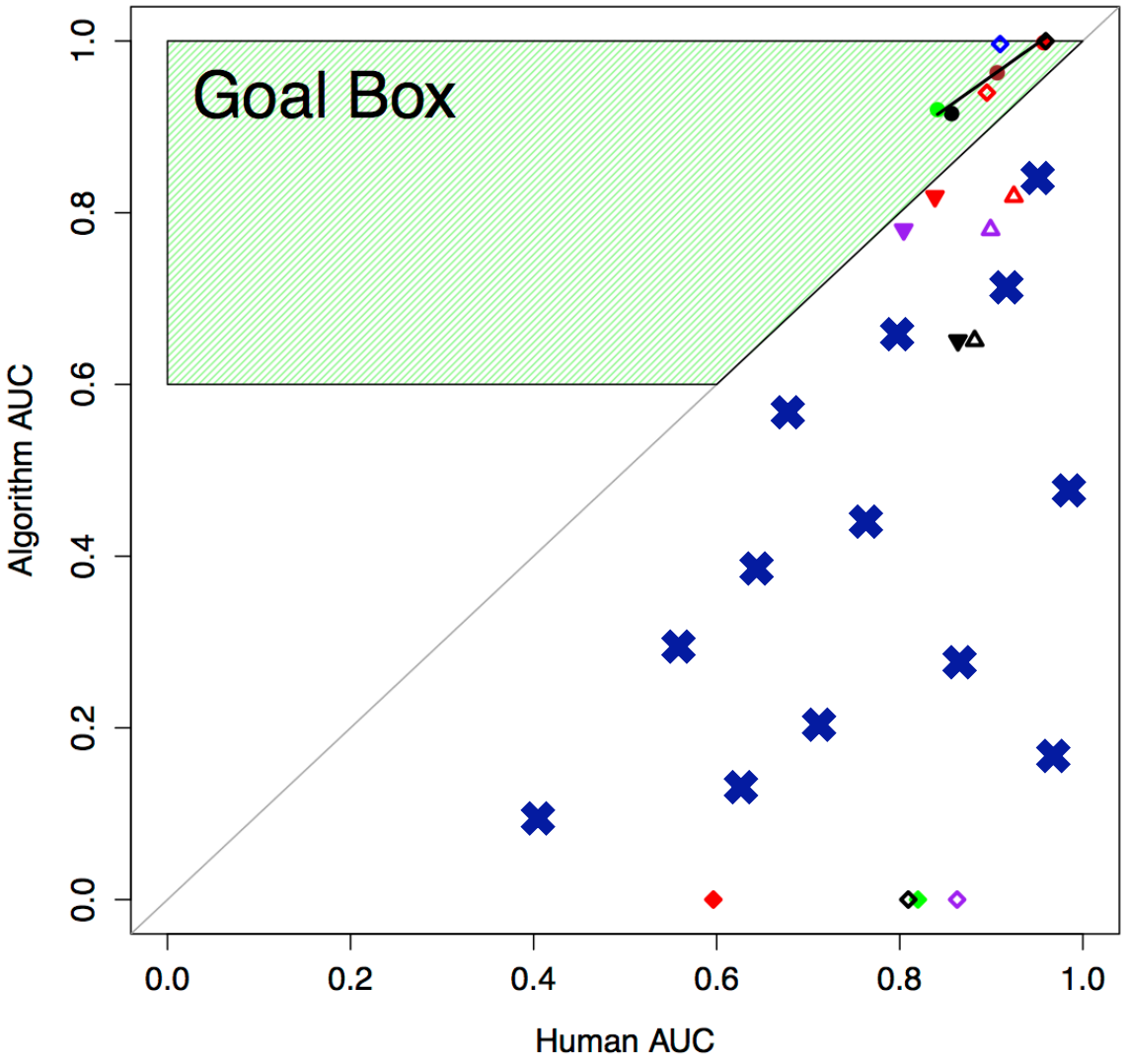
Hurdle: Measuring Success

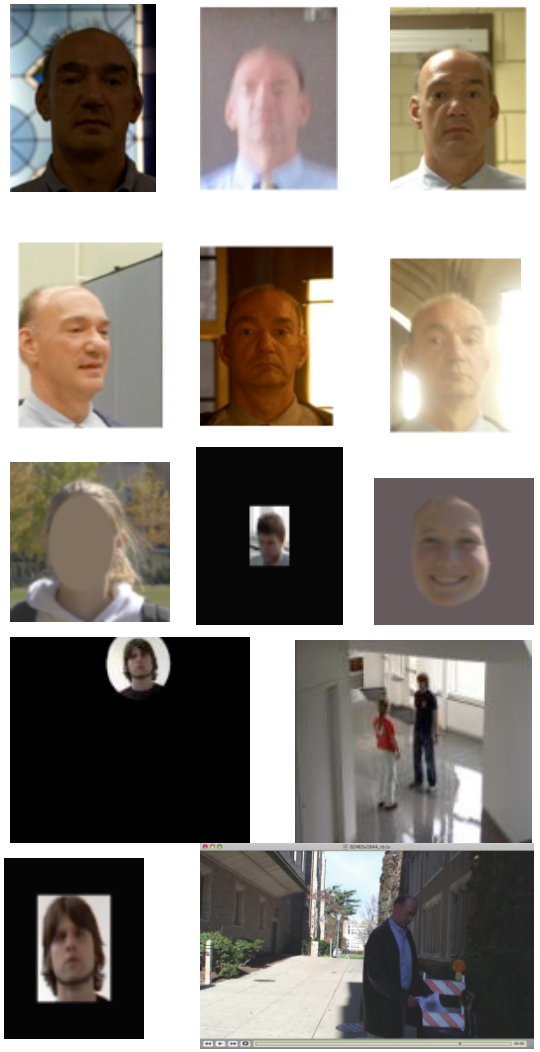


Hurdle: Measuring Success

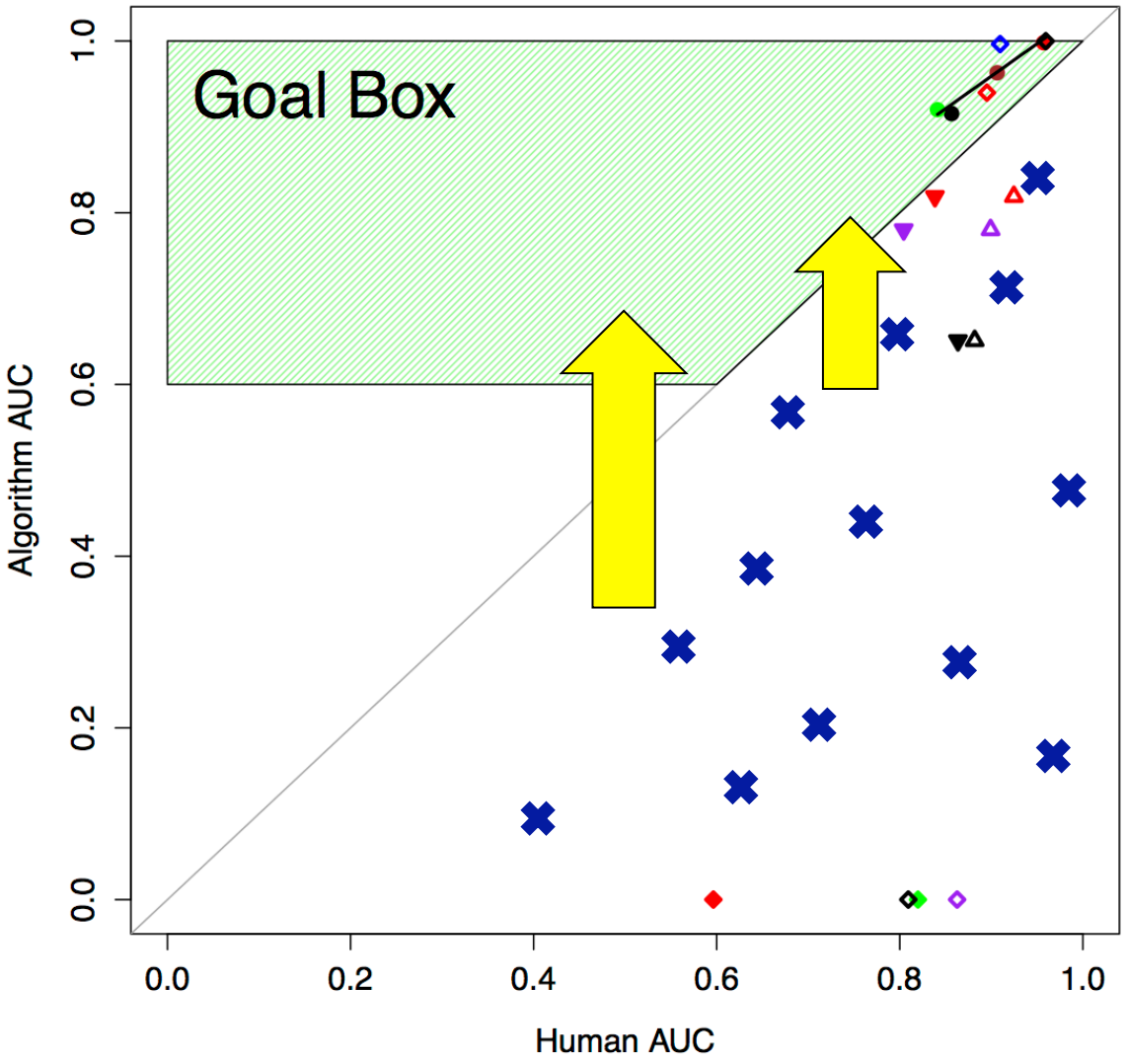


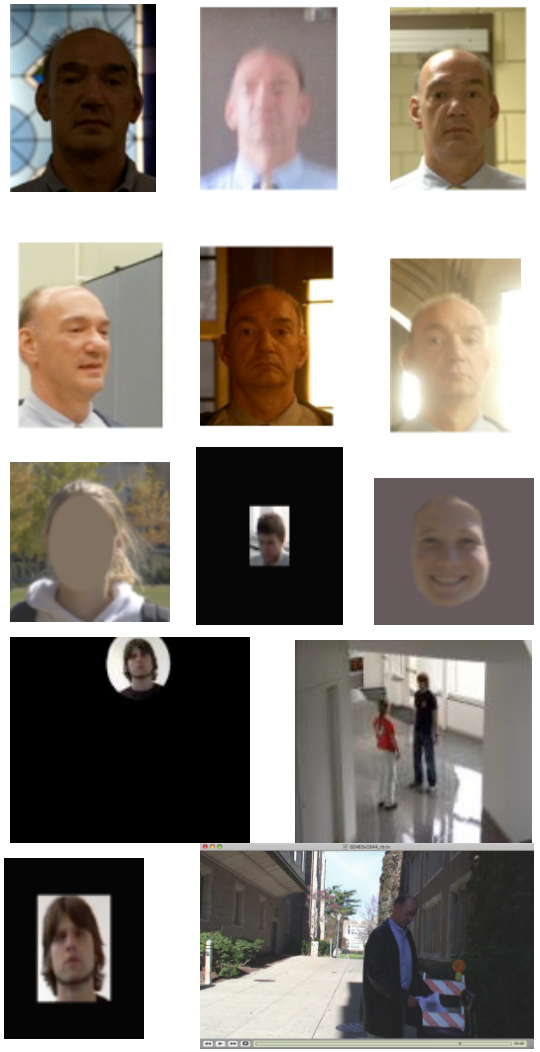
Face Performance Index





Face Performance Index





The Challenge

- Problem: Robust Recognition of Unfamiliar Faces
- Goal: Human Level Performance
  - Untrained Humans
  - Trained Professionals
  - Forensic Examiners
- Compare Machine & Human on a Face Performance Index
- Objective: Move Machine Performance into the Goal Box

NIST

Questions?